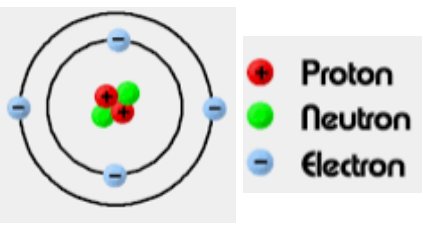
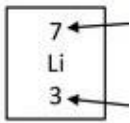
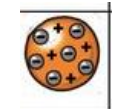
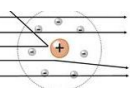
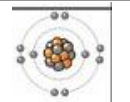
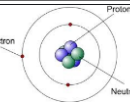


The atom

1	The atom			
2	Subatomic particles	Name of particle	Relative charge	Relative mass
		Proton	+1	1
		Neutron	0	1
		Electron	-1	Very small
3	 Mass number (Total of protons + neutrons in nucleus) Atomic number (number of protons = no of electrons)			

Models of the atom (common content with physics)

1	Pre 1900 Billiard ball		John Dalton- before electrons were discovered atoms were tiny solid spheres
2	1897 Plum pudding		JJ Thompson- Ball of positive charge with negative electrons.
3	1909 Nuclear	Alpha particle scattering experiment 	Ernest Rutherford-Beam of alpha particles directed at very thin gold foil, most passed through, some deflected by positive nucleus, few reflected back. Result: positively charged nucleus surrounded by negative electrons.
4	1913 Bohr		Niels Bohr- Electrons orbit the nucleus in fixed shells as specific distances
5	Quantum		James Chadwick- Neutrons exist within the nucleus

Key Vocabulary

1	Atom	The smallest unit of matter. Have a radius of approx 0.1 nm. Have no overall charge.
2	Element	A substance made up of only one type of atom, which cannot be chemically broken into other substances. Represented by symbols Eg: Na. Approx 100 different elements.
3	Compound	A substance made of two or more elements that have bonded chemically. These atoms are usually, but not always, joined in molecules. Can only be separated into elements by chemical reactions.
4	Mixture	Two or more elements or compounds, not chemically bonded together. Can be separated by physical processes.
5	Molecule	A group of atoms, usually but not always representing more than one element, joined by chemical bonds. Compounds are typically made of up molecules.
6	Mass number	The sum of the protons and neutrons in the nucleus
7	Atomic number	The number of protons in the atom. Number of protons = Number of electrons
8	Nucleus	The center of an atom, a region where protons and neutrons are located. The nucleus accounts for the atomic mass. Radius=less than 1/10000 ($1 \times 10^{-14} \text{m}$) of atom
9	Neutron	A subatomic particle that has no charge. Found in the nucleus.
10	Proton	A positively charged particle in an atom. The number of protons in the nucleus of an atom is the atomic number of an element.
11	Electron	A negatively charged particle in an atom.
12	Isotope	Atoms of the same element with the same number of protons, however a different number of neutrons. This means they have a different mass number.
13	Ion	An atom or atoms that has lost or gained one or more electrons, to become a charged particle. Eg: Na^+

Electronic structure

1	Maximum number of electrons in each shell Shell 1- 2 electrons Shell 2- 8 electrons Shell 3- 8 electrons Shell 4- 2 electrons	LEARN TO DRAW THE FIRST 20 ELEMENTS STRUCTURES AS BELOW EXAMPLES
2	EXAMPLES  Helium-4 2  Sodium-23 2, 8, 1 Use dots or crosses to represent electrons clearly	

Practical separation techniques

	Method	Example
1	Filtration-separate insoluble solid from liquid	Separate sand from a mixture of sand, salt and sea water
2	Crystallisation-separate solid from solution	Obtain pure crystals of sodium chloride from salt water
3	Simple distillation- separate solvent from solution	Separate pure water from salt water
4	Fractional distillation- separate mixture of liquids with diff bp's	Separate different compounds in crude oil
5	Chromatography- separate substances(varying solubility)	Separate out the dyes in food colouring

Developments of the periodic table		
1	Before discovery of protons, neutrons, electrons	Elements ordered by atomic weight. Some were placed in wrong groups and the periodic table was incomplete
2	Mendeleev	Left gaps to fill in newly found elements. Knowledge of isotopes explained why atomic weight order wasn't always correct
3	Now: Elements arranged in order of atomic number	Elements with similar properties in groups (columns)- have same No of electrons in outer shell AND periods (rows)- have same number of electron shells

Half equations + ionic equations (HT ONLY)

-Links to Chemical changes unit

1	Reduction: Positive metal ions (cations) gain electrons to form neutral atoms	$\text{Cu}^{2+} + 2\text{e}^{-} \rightarrow \text{Cu}$
2	Oxidation: Negative non-metal ions (anions) lose electrons to form neutral atoms	$2\text{Cl}^{-} \rightarrow \text{Cl}_2 + 2\text{e}^{-}$
3	Half equations combine to form ionic equations to show overall reactions	$\text{Cu}^{2+} + 2\text{Cl}^{-} \rightarrow \text{Cu} + \text{Cl}_2$

Alkali metals (Group 1)

Very reactive with oxygen, water, chlorine -Have 1 electron in outer shell. Form +1 ions. More reactive down group -Outer negative electron further from positive nucleus so more easily lost

Reactions of Alkali metals (Group 1)

1	With oxygen	Metal + oxygen → metal oxide	e.g. $4\text{Na} + \text{O}_2 \rightarrow 2\text{Na}_2\text{O}$
2	With water	Metal + water → metal hydroxide + hydrogen	e.g. $2\text{Na} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{H}_2$
3	With metal chloride	Metal + chlorine → metal chloride	e.g. $2\text{Na} + \text{Cl}_2 \rightarrow 2\text{NaCl}$

Halogens (Group 7)

Diatomic molecules (pair of atoms)-7 outer shell electrons, form 1+ ions, Mp's/Bp's increase down group- increasing atomic mass No, decreasing reactivity down group-increasing proton No so electrons gained easier

Reactions of Halogens (Group 7)

1	With metals	Metal + halogen → metal halide e.g. Sodium + chlorine → sodium chloride	e.g. NaCl metal atom loses outer shell electrons and halogen gains an outer shell electron
2	With hydrogen	Hydrogen + halogen → hydrogen halide e.g. Hydrogen + bromine → hydrogen bromide	e.g. $\text{Cl}_2 + \text{H}_2 \rightarrow 2\text{HCl}$
3	With aqueous solution of a halide salt	Chlorine + potassium bromide → potassium chloride + bromine	e.g. $\text{Cl}_2 + 2\text{KBr} \rightarrow 2\text{KCl} + \text{Br}_2$

Noble gases (Group 0)

1	Unreactive, do not form molecules	Due to having full outer shells of electrons
2	Bp's increase down group	Increasing atomic number

Chemical equations

1	Word equations- Do not show what happens to the No of atoms	Uses words to show reaction reactants → products magnesium + oxygen → magnesium oxide
2	Symbol equations- Show No of atoms/molecules. Must be balanced.	Uses symbols to show reaction reactants → products $2\text{Mg} + \text{O}_2 \rightarrow 2\text{MgO}$

Transition metals (CHEMISTRY ONLY)

1	Compared to group 1	Less reactive, harder, denser, higher mp's	Cu^{2+}	Blue
			Ni^{2+}	Pale green (used to make margarine)
2	Properties	Different ions with diff charges, used as catalysts, form coloured compounds	Fe^{2+}	Green (Use Haber process)
			Fe^{3+}	Reddish/brown
			Mn^{2+}	Pale pink

Key vocabulary

1	Periodic table	A chart that shows the elements arranged in order of atomic number, along with chemical symbol and the average atomic mass (in atomic mass units) for that particular element.
2	Periods	Rows of the periodic table of elements. These represent the number of energy levels for electrons in atoms of the elements. Eg: Na- period 3
3	Groups	Columns on the periodic table of elements, ordered according to the numbers of electrons in the outer shells of the atoms of each element Eg: Na- group 1- 1 electron in outer shell
4	Chemical symbol	A one-or two-letter abbreviation for the name of an element. Eg: Na (Sodium)
5	Chemical equations	Show chemical reactions with reactant/s and product/s. Law of conservation of mass states the total mass of products = total mass of reactants

Alkali metals Transition metals Halogens Noble gases																	
H	He																
Li	Be	B	C	N	O	F	Ne										
Na	Mg	Al	Si	P	S	Cl	Ar	K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	?	?	?						

Metals and non-metals

1	Metals	Left of dark line on periodic table	Form positive ions, conductors, high mp's/bp's, ductile, malleable
2	Non-metals	Right of dark line	Form negative ions, insulators, low mp's/bp's